

Asexual Reproduction

Reproduction. The life process by which organisms give rise to new individuals of their own kind is called reproduction.

Asexual reproduction is the method of producing offspring from only one parent. Lower plants and animals reproduce asexually. Higher plants and animals (as well as some of the lower forms) reproduce sexually. In sexual reproduction two parents are required to produce a new individual. This type of reproduction will be discussed in the next unit.

The power to reproduce is a property of protoplasm possessed by every mature living thing. Reproduction is essential for the continuance of life from one generation to the next, because every individual must eventually die.

The Theory of Spontaneous Generation. Until scientists proved that "all life comes from life", people believed that offspring arose from nonliving matter. This is the theory of spontaneous generation. According to this false belief, maggots and worms arose from decaying meat; rats and mice from old rags; and snakes from horse hairs.

Methods of Asexual Reproduction. Asexual reproduction can be carried out in five different ways: binary fission, budding, spore formation, vegetative propagation, and regeneration.

1. Binary Fission. Binary fission is a method of asexual reproduction in which the nucleus divides equally by mitosis, and the cytoplasm also divides equally. Binary fission is the simplest method of reproduction occurring mainly in unicellular forms of life. Examples are the spirogyra and bacteria, green algae, and the amoeba and paramecium.

Binary Fission in the Amoeba. By the process of binary fission, an amoeba becomes two amoebae as follows:

- a. When an amoeba reaches full size, the nucleus divides into two equal parts. The nuclei move away from the center, both going to opposite ends of the cell.
- b. The cytoplasm also divides equally, each half enclosing a newly formed nucleus.
- c. The division of the parent cell forms two new individuals called daughter cells.

Note that the parent cell passes out of existence after binary fission has taken place. Half of the nucleus and half of the cytoplasm of the parent cell have been given to each of the daughter cells. When the daughter cells reach maturity they then undergo binary fission, each cell becoming two.

2. Budding. Budding is another simple method of asexual reproduction. In budding the nucleus divides equally, but the cytoplasm divides unequally. Examples of organisms that reproduce by budding are the yeast (unicellular fungus), and the sponge and hydra. (simple multicellular animals).

Budding in the Yeast, Budding takes place in the yeast as follows:

- a. Part of the cytoplasm pushes out of the parent cell, forming a knoblike growth, called a bud.
- b. The nucleus of the parent cell moves toward the bud, where it divides equally.
- c. One nucleus enters the bud, the other nucleus remaining in the parent.
- d. A cell wall forms between the bud and the parent cell.
- e. The bud grows, and then may break away from the parent, thus giving rise to two individual organisms.

The bud may not break away from the parent, cell, and may give rise to a bud of its own. After a few such divisions, there is formed a chain of attached yeast cells, called a colony.

Budding in the Hydra. The hydra is a simple, multicellular animal which reproduces by budding. A small outgrowth, the bud, appears on one side of the body of the parent hydra. As the bud grows larger, tentacles appear. When the bud is fully developed, it breaks away from the parent and continues life as a completely new individual.

3. Spore Formation. This is an asexual method of reproduction by which a number of small cells, called spores are produced by an organism, each spore capable of giving rise to a new individual. Spores are formed in a spore case, or sporangium. Fungi, such as mushrooms, molds, rusts, and mildews, are plants that produce spores.
4. Vegetative Propagation. The rise of a new plant from part of a plant is an asexual form of reproduction that occurs in many plants.

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- a. Bulbs. A bulb is short underground stem with fleshy leaves that contain stored food. A bulb taken from the parent plant and placed in the soil will develop into a new individual plant. Plants that reproduce from bulbs are the lily, tulip and onion.
- b. Tubers. A tuber is an enlarged underground stem containing stored food. The white potato is a tuber. Scattered over the white potato are numerous *buds*, called "eyes". The white potato can be propagated by planting a whole tuber or part of a tuber containing a few eyes.
- c. Runners (stolons). A runner, or stolon, is a stem that grows along the ground. Several inches away from the parent, it takes root and gives rise to an individual plant. The strawberry plant and some grasses reproduce vegetatively from runners.
- d. Rhizomes. A rhizome is a long stem that grows horizontally underground. From buds which form at intervals on the rhizome, new leaves and roots are produced, thus forming a new plant. The iris, fern and several grasses propagate in this manner.
- e. Grafting. Grafting is a type of vegetative reproduction performed artificially by man. A new organism is not produced by the process. Grafting is employed for the following reasons: (1) to maintain a desired type of fruit or flower where there is a possibility that seeds will not give rise to the same plant, and (2) to propagate desirable varieties of seedless fruits which cannot be continued any other way.

In the process of grafting, a person inserts a part, of one tree into another tree. The rooted tree that receives the graft is called the stock. The part of the original tree that had been removed and is being grafted is the scion.

To be successful, the scion and the stock must be of the same or closely related species. For example, a branch may be removed from a Bartlett tree (scion) and grafted onto a crab-apple tree (stock). The scion will continue to bear the same type of fruit it bore before it was grafted, namely Bartlett pears.

Frequently, grafts are made onto stocks which are strong and healthy, but which are not bearing desirable fruits or flowers. For example, commercial rose growers graft branches of valuable roses onto stocks that are healthy, but flowering poorly.

A scion may be either a branch or a bud.

Grafting a Branch. A branch is cut from a young tree of a desired variety and inserted into a branch of a mature tree. Such a graft is used, to produce varieties of apples, plums, pears, and walnuts.

Grafting a Bud (Budding). The growing tip of a stem containing a bud is cut from a desired variety of tree or bush and inserted into a slit under the bark of a young tree or bush. Budding produces varieties of peaches, cherries, plums, and roses.

For a successful graft, the cambium, or growing tissue, of the scion and of the stock must make contact with each other. In this way, minerals and water can pass from the stock into the grafted scion. After growth has taken place, the scion becomes a permanent part of the stock.

5. Regeneration. Regeneration is the reproduction of a lost part of an organism. Lower animals such as the hydra, planarian (flatworm), and starfish, have the ability to regenerate (or regrow) a part of its body that has been injured or cut off.

Regeneration is a process closely related to vegetative reproduction, because a new individual can be formed from a part of the organism. For example, if a hydra, planaria, or starfish is cut into two or more pieces, each piece may give rise to a complete organism.

Animals such as the lobster and crab are not able to produce a completely new organism by regeneration, but can replace certain parts lost through injury. People have the ability to heal wounds by regeneration, but cannot reproduce a lost part. That is, a finger, arm, or leg cut from the body will not grow back.

Economic Importance of Regeneration

- a. Fishermen cultivate sponges by cutting living sponges into a few small pieces. When the pieces develop into complete organisms they are harvested.
- b. An enemy of oyster fishermen is the starfish. Until quite recently they would catch starfish, which feed on oysters, cut them up into several pieces and throw them back into the water, believing that they had destroyed the animal. They did not know then that each of the pieces could regenerate into a complete starfish. Today, fishermen simply keep the starfish out of the water and under a strong sun until they die.

Advantages of Asexual Reproduction. The offspring that arise by asexual reproduction are

- (1) all alike in characteristics
- (2) produced in great numbers, and
- (3) produced in a comparatively short period of time.